

Disease Detectives

BCS Invitational

January 30th, 2016

General Instructions:

DON't write on test package. USE ANSWER SHEETS ONLY!!!

You have 50 minutes to complete this test. Only those answers placed in the answer sheet will be awarded points. As always, no cellular devices are allowed at any time.

The tiebreakers for this test are as follows:

1st- Case Study 1-Most correct points

2nd- Case study 2- Most Correct points

3rd- Most points in Question 4

Good luck and have fun!!

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1. Match the definitions of column A with those in column B (1 point Each-10 points)

Column A	Column B
1. 200 cases of Marburg virus infection in several districts in Angola over several months (usually none)	A. Clinical Trial
2. 40 cases of <i>Salmonella</i> Enteritidis in 1 week traced to a single meal served at a cafeteria (usually none)	B. Cluster
3. A study in which children are randomly assigned to receive either a newly formulated vaccine or the currently available vaccine, and are followed to monitor for side effects and effectiveness of each vaccine	C. Isolation
4. British investigators conducted a study to compare measles-mumps-rubella (MMR) vaccine history among 1,294 children with Autism and 4,469 children without Autism	D. Epidemic
5. The Iowa Women's Health Study, in which researchers enrolled 41,837 women in 1986 and collected exposure and lifestyle information to assess the relationship between these factors and subsequent occurrence of cancer	E. Vehicle
6. 10 cases of cancer diagnosed over 2 years among residents of a single neighborhood (previous data not available)	F. Outbreak
7. The separation of infected persons to prevent transmission to susceptible ones	G. Incubation period
8. The progression of an infectious agent that leaves its reservoir or host through a portal of exit, is conveyed by a mode of transmission, and then enters through an appropriate portal of entry to infect a susceptible host	H. Cohort Study
9. The period between exposure to disease and onset of symptoms	I. Chain of Infection
10. An inanimate intermediary in the indirect transmission of an agent that carries the agent from a reservoir to a susceptible host	J. Case Control Study

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2. Concisely list the ten steps of investigating an outbreak (5 points)

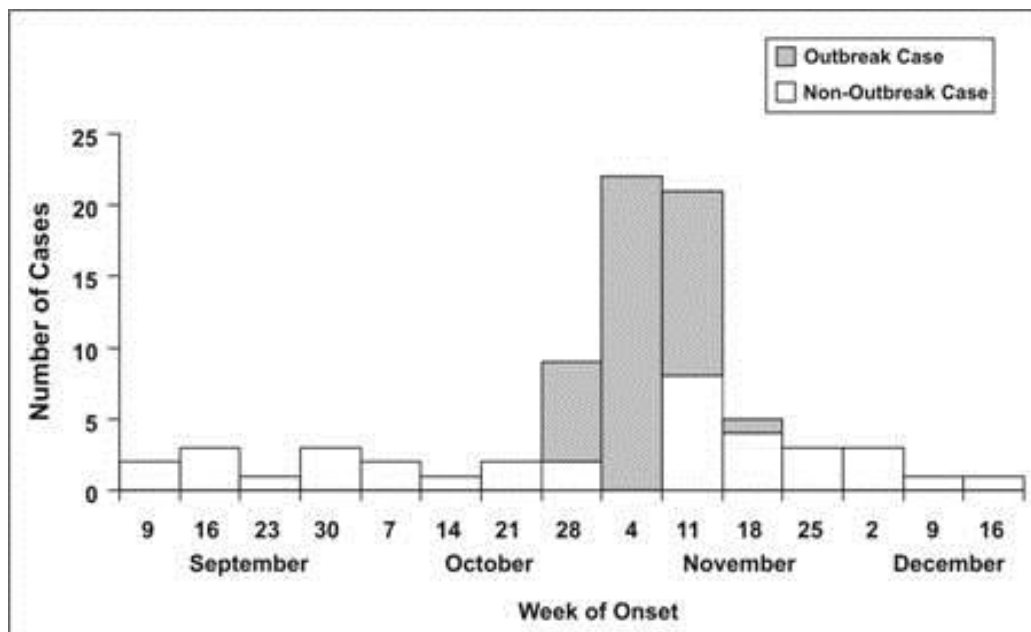
3. Fill in the blanks matching the descriptions with the appropriate study design. Note that some answers may be used more than once. (10 points)

A. Cross sectional study B. Cohort C. Case-Control D. Randomized Controlled Trial

- (i) Best suited for assessing an exposure-disease relationship when the outcomes are rare ____
- (ii) Best suited for determining the prevalence of a given health-related state or event ____
- (iii) Best suited if the exposure is extremely rare ____
- (iv) Best suited for generating incidence rates ____
- (v) Potential bias from low response rate ____

4. Epidemiological curve Interpretation (10 points)

The figure below shows an outbreak of Hepatitis A in a Sub shop at Massachussets, 2001.



A. When did the outbreak start and what date did the outbreak end? _____

B. What was the peak of the outbreak? _____

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C. What kind of Epidemic Curve is this? _____

The incubation period for hepatitis A ranges from 15 to 50 days (roughly 2 to 7 weeks), with an average incubation period of 28–30 days (roughly one month).

D. When is the likely dates of exposure, based on the minimum incubation period before the first case? _____

5. Using the following data to answer the next 5 questions (10 Points)

Regionville is a community of 100,000 persons. During 1985, there were 1,000 deaths from all causes. During the same time, the number of cases of Tuberculosis was 300: 200 males and 100 females. During 1985, there were 60 deaths from tuberculosis, 50 of them in males.

(i). Crude mortality rate in Regionville is

- a. 300 per 100,000
- b. 60 per 1,000
- c. 10 per 1,000
- d. 100 per 1,000
- e. Cannot be computed from the data given

(ii) The proportionate mortality rate due to tuberculosis is

- a. 20%
- b. 30%
- c. 6%
- d. 3%
- e. Cannot be computed from the data given

(iii) The case fatality rate for tuberculosis is

- a. 6%
- b. 20%
- c. 2%
- d. Equal in males and females
- e. Cannot be computed from the data given

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(iv) The cause-specific mortality rate for tuberculosis is

- a. 60 per 100,000
- b. 300 per 100,000
- c. 200 per 1,000
- d. 20%
- e. Cannot be computed from the data given

(v) When a new treatment is developed for a disease that prevents death but does not produce recovery from disease, the following will occur:

- a. Prevalence of disease will decrease
- b. Incidence of the disease will increase
- c. Prevalence of the disease will increase
- d. Incidence of the disease will decrease
- e. There will be no change in incidence or prevalence.

6. Eating Fish Study

The preventive advantages of eating fish have been reported in numerous studies. A recent cohort study¹ reported that not eating fish increased the risk for stroke. Amongst, 1631 subjects who never ate fish, 82 subjects developed stroke and amongst 802 subjects, who ate fish daily, 23 subjects developed stroke.

A. What type of study is this? (2 points)

B. Show a 2 by 2 table depicting the results of this study and calculate the risk of association (6 points)

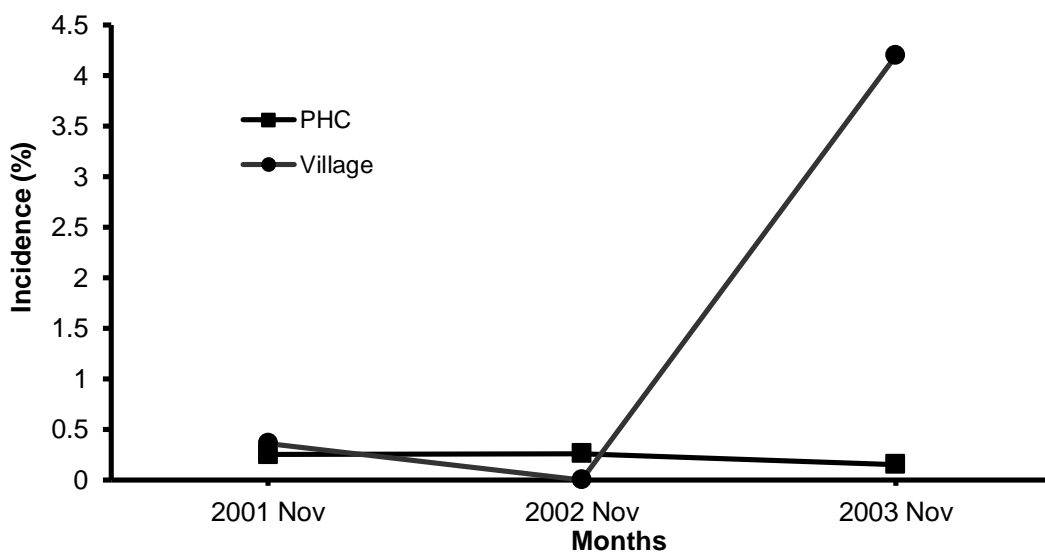
C. How would you interpret the risk of association that you have calculated above? (4 Points)

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7. Case study 1: An Outbreak Of Cholera Associated With An Unprotected Well In Parbatia, Orissa, Eastern India.

On 14 November 2003, a primary health centre in Dhenkanal district, Orissa, Eastern India, reported a cluster of acute, severe diarrhea with dehydration among adults in the village of Parbatia to the district public-health authorities. The population of the village in 2003 was 946. Cholera was suspected in the diagnosis. On 15 November 2003, an epidemiologist from the FETP assigned to the state of Orissa initiated an investigation and arrived in the village in the morning to investigate the outbreak. His first task was to compare the incidence of acute diarrhea in Parbatia and the corresponding Primary health Centre (PHC) during the months of November for 2001-2003 (**Error! Reference source not found.**). He also defined a case of diarrhea as the occurrence of more than three watery stools a day among residents of the village in November 2003.

Incidence of Diarrhea



1. Based on figure 1. Would you consider the diarrheal illness as an outbreak? Why /why not? (2 points)
2. What would be the case definition for the study? (2 points)
3. Name 4 organisms that cause diarrheal illness (4 points).

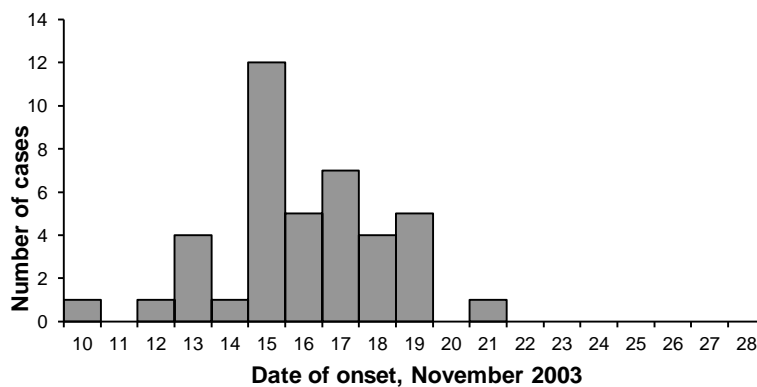
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4. Calculate the Attack rates of cholera by age and sex, for this outbreak (10 points)

		Number of cases	Population	Incidence (rates)
Age group (In years)	0 to4	6	113	
	5 to14	4	190	
	15 to24	5	128	
	25 to34	5	144	
	35 to44	6	129	
	45 to54	4	88	
	55 to64	8	67	
	> 65	3	87	
Sex	Male	17	481	
	Female	24	465	
Total	Total	41	946	

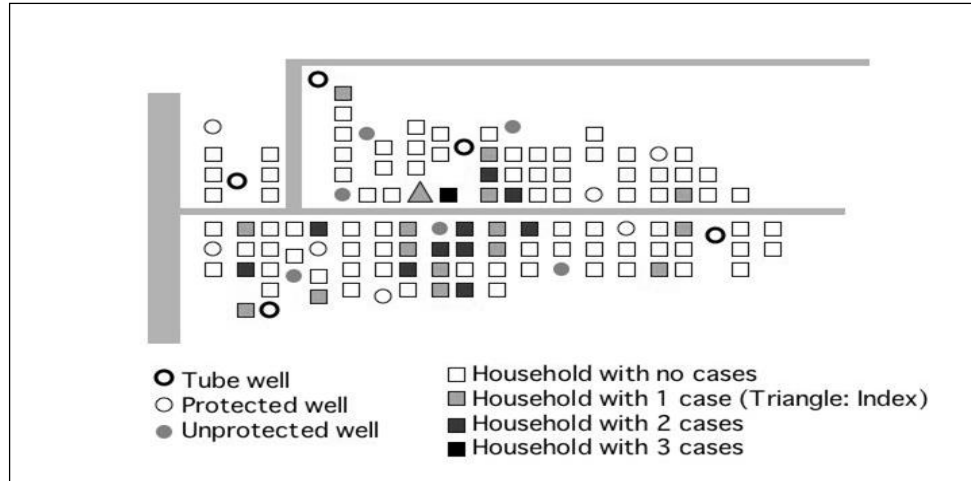
5. How would you interpret the attack rates you calculated above? (2 points)

6. The Study investigators constructed a epidemic curve for this outbreak. Based on the figure shown below, what type of an epidemic is this? (2 points)



Cholera cases by residence

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7. Based on above figure, which of the wells was likely associated with this outbreak? (2 points)

- A. Tube well
- B. Protected well
- C. Unprotected well
- D. All of the above.

All the case-patients identified (minus the initial, index patient, who we suspected to be the source) were included during the door to-door case search using the same case definition. For each case-patient, two neighborhood control subjects matched for sex, age (one year), and socioeconomic status were recruited. Only those control-subjects who apparently did not have cholera were included. A standardized, close-ended questionnaire was used for collecting information on potential exposures from the subjects. We defined our referent exposure period as three days preceding the illness.

Forty-one cases were identified from 40 case patients among the 946 residents of the village. There were no deaths. Of the 40 case-patients, 29% had vomiting, 47% had abdominal pain, and 32% had dehydration. None had blood in stools or fever. We recruited 40 matched case-control sets for the case-control study (excluding the initial case patient). Their median age was 35 years, and 23 (58%) of the 40 case-patients were female. Twenty-eight (70%) of the 40 cases had drunk water from the suspected well compared to 23 (29%) of the 80 matched controls.

8. Calculate the risk of association between drinking from the contaminated well amongst the cases and controls? Show the 2 by 2 table and calculations. (6 points)

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9. Provide an interpretation of the above risk of association that you calculated? (4 points)

10. Why did the investigators have to match the cases and controls by age and sex (2 points)

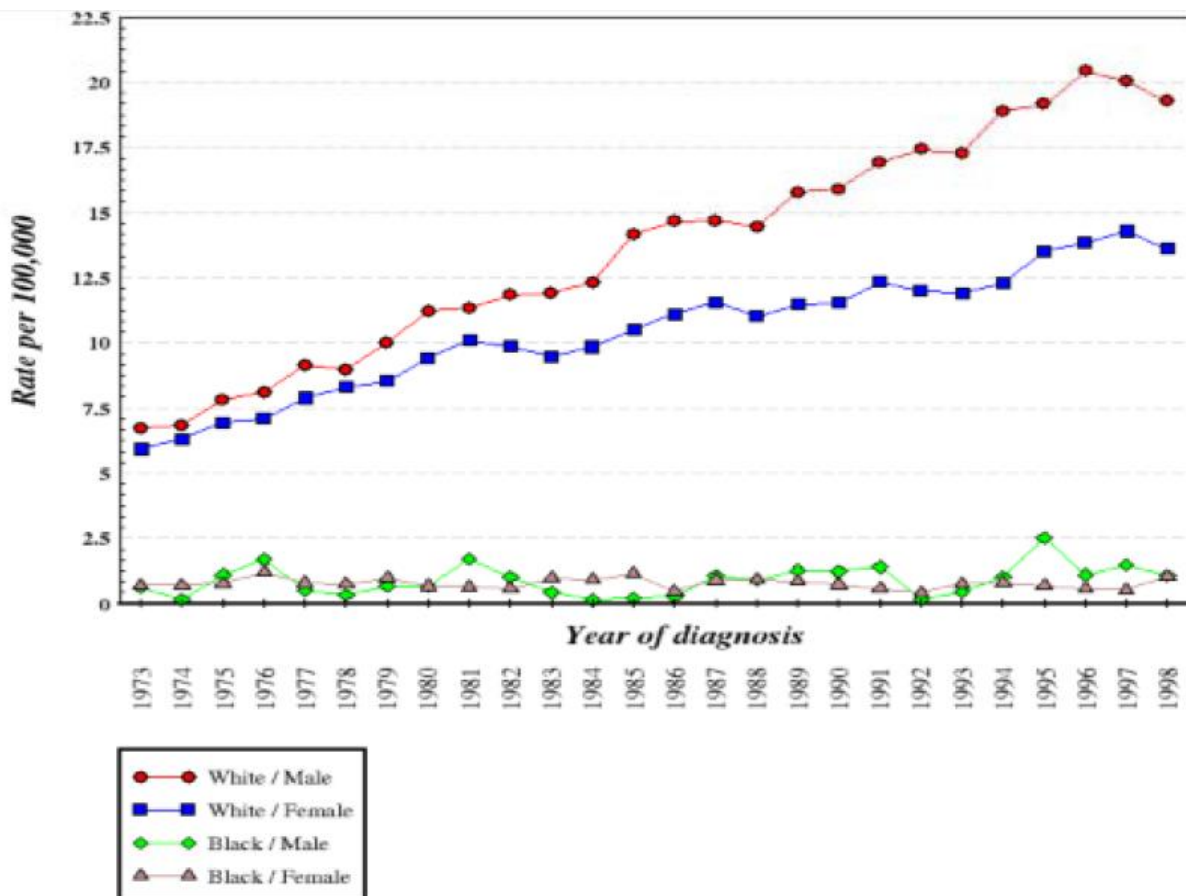
11. Name 2 strategies used by epidemiologists to overcome confounding? (2 points)

8. Case Study 2: Skin Cancer Epidemiology and Prevention

The Surveillance, Epidemiology, and End Results (SEER) Program of the National Cancer Institute collects and publishes cancer incidence and survival data from registries covering approximately 14% of the U.S. population. Using the SEER data in the table on the next page, answer the questions that follow.

Age-adjusted incidence of melanoma by race and gender; SEER data, 1973–1998.

(Source: National Cancer Institute)



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1. What is the definition of incidence rate? (3 points)

2. Referring to Figure 1, give the 1998 incidence rate for the following groups: (8 points)

White Men _____

White Women _____

Black Men _____

Black Women _____

3. Give two possible reasons for the observed large differences in incidence rates between races. (4 points)

You know that the major preventable cause of skin cancer is exposure to ultraviolet (UV) radiation from the sun over many years. To determine which behaviors of people put them at risk for sun exposure, you find an excellent resource, the Youth Risk Behavior Survey (YRBS). The survey collects data on important health-related behaviors, such as smoking and exercise, among young people. Data from the YRBS are used at the national, state, and local levels for a variety of public health programs.

Students complete the self-administered YRBS questionnaire in their classrooms during a regular class period, recording their responses directly on a computer-scanned answer sheet. The students' parents' permission is obtained before the survey. For the first time, in 1999, the national YRBS asked students about sunscreen use.

Table 1, on the next page, includes findings on sunscreen use from a sample of 15,439 U.S. high school students. Students were asked, "How often do you wear sunscreen or sun block with an SPF of 15 or higher when you are outside for more than one hour on a sunny day?" Possible multiple-choice responses included "never," "rarely," "sometimes," "most of the time," or "always."

4. What kind of study is this? (2 points)

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Use the following table to answer Question 5-8: Prevalence of sunscreen use¹ among U.S. high school students, by demographic characteristics — Youth Risk Behavior Survey, 1999.²

Demographic Characteristics	N ³	Never (%)	Rarely (%)	Sometimes (%)	Most of the time or always (%)
Total	15,349	35.9	29.3	21.4	13.3
Age (years)					
≤14	1,308	30.5	26.1	25.9	17.5
15	3,378	35.2	29.1	22.1	13.7
16	988	35.3	29.8	21.2	13.7
17	4,013	36.6	30.4	21.1	11.9
≥18	2,631	41.0	29.1	18.3	11.6
Sex					
Female	7,828	29.8	28.4	23.8	18.1
Male	7,445	42.0	30.3	19.1	8.6
Race or Ethnicity					
White	5,407	25.0	32.5	26.0	16.5
Black	4,283	74.1	13.7	7.4	4.8
Hispanic or Latino	4,106	43.2	28.4	17.6	10.8
Grade					
9	3,786	37.0	27.5	21.0	14.6
10	3,787	34.2	29.5	22.8	13.6
11	3,885	35.8	30.1	21.7	12.5
12	3,823	36.6	30.7	20.3	12.4

(Source: Hall HI, Jones SE, Saraiya M. Correlates of Sunscreen Use. Journal of School Health)

¹ Wear sunscreen or sun block with an SPF of 15 or higher when outside for more than one hour on a sunny day.

² Prevalence estimates based on weighted data.

³ Unweighted numbers. Numbers may not add to total because of missing information.

5. Define Prevalence (3 points)

6. Using Table above, determine the prevalence for frequent (“most of the time” or “always”) sunscreen use. (2 points)

7. Use the data in Table 1 to identify three characteristics of a hypothetical student who is least likely to use sunscreen. (6 Points)

8. Besides use of sunscreens to reduce exposure to UV light, give 2 other sun safety strategies (4 points)